Dewart Lake Aquatic Vegetation Management Plan 2007 Update

Kosciusko County, Indiana



http://129.79.145.7/arcims/statewide%5Fmxd/viewer.htm

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Executive Summary

Dewart Lake was treated with Sonar (active ingredient: fluridone) on May 26, 2006. This treatment was designed to drastically reduce the Eurasian watermilfoil (EWM) population and allow native plants to colonize areas where the milfoil was previously dominant. Two separate vegetation surveys were conducted on Dewart Lake in August of 2006 after the chemical treatments. One survey was conducted by District 3 Fisheries Biologist Jed Pearson. The other was conducted by Aquatic Weed Control. Eurasian watermilfoil was not found in either survey. The chemical treatment was successful in reducing the Eurasian watermilfoil to the point that it was undetectable in late summer of 2006.

Eurasian Watermilfoil (EWM) was still undetectable in Dewart Lake in August of 2007. A visual survey was conducted on June 13, 2007 for the presence of EWM, and a late season Tier II survey was conducted on August 15, 2007 to monitor both native and invasive plant populations following the whole lake Sonar treatment in 2006. These surveys found no EWM plants in the lake. Sago pondweed, a beneficial native plant, had become dominant in many areas previously infested by EWM.

In 2007, no herbicide treatments of any kind were conducted on the main lake. This allowed for native plants to re-establish themselves after the 2006 whole lake Sonar treatment. Treatments were allowed in the channel behind Blueberry Island.

The 2007 late season vegetation survey showed that many native plants were reestablishing themselves and that Eurasian watermilfoil was still undetectable in Dewart Lake. Aside from EWM the biggest population changes were seen in the coontail and sago pondweed populations. Coontail site frequency dropped from 43.3% in 2006 to 5.6% in 2007. Ideally an increase in coontail frequency would be seen in 2008. Sago pondweed frequency increased from 4.4% in 2006 to 28.9% in 2007. Curly leaf pondweed abundance increased from 1.3% in 2005 to 7.8% in 2006, to 8.9% in 2007. Curly leaf pondweed is most abundant along the frontage of Blueberry Island, which was privately treated up until the whole lake Sonar treatment.

Funding should be set aside to treat areas of Eurasian watermilfoil (EWM) re-growth, as some re-growth is expected in 2008. Areas of re-growth may be treated with Renovate or 2, 4-D herbicide, although 2, 4-D is being recommended at this point.

*All cost figures are estimates only. All prices are subject to change pending 2008 chemical pricing.

- 1. Chemically treat areas of Eurasian milfoil growth
 - A. Treat up to 25 acres for Eurasian milfoil with 2, 4-D

\$9,500

2. Conduct a spring visual survey and late season Tier II survey to monitor both Eurasian milfoil and native plant populations. Possibly conduct some mapping of some emergent vegetation.

Note: Emergent mapping protocol has not yet been established by the IDNR for this project. Survey and plan costs may increase depending on emergent requirements.

A. Aquatic Vegetation Surveys and Plan Update

\$6,000





Acknowledgements

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1.0 Introduction

Dewart Lake has been involved in the Lake and River Enhancement Program (LARE) since 2005, when the first LARE funded aquatic vegetation survey took place on May 19, 2005. Based on the results of the 2005 surveys, a whole lake Sonar treatment was conducted in the following spring on May 26, 2006 for the control of Eurasian watermilfoil. The treatment was successful, and Eurasian watermilfoil was not found in the late season plant surveys of 2006. In 2007, no herbicide treatments were conducted on the main lake, giving native plants a chance to re-colonize areas of previous EWM infestation. A late season vegetation survey was conducted by Aquatic Weed Control on August 15, 2007. This survey found that EWM was still absent from the lake and that sago pondweed, a beneficial native plant, had become dominant in many areas previously infested by EWM. Table 1 summarizes all LARE funded activities on Dewart Lake. The original aquatic vegetation management strategy started in 2005 and runs through 2009.

Table 1: Dewart Lake LARE History

Year Year	Action Action	Date	Funding Source
2005	Spring and Late Season Aquatic Vegetation Surveys Aquatic Vegetation Management Plan Development	Spring Survey May 19, 2005 Late Season Survey July 27, 2005	Lake and River Enhancement Dewart Lake Protective Association
2006	Whole Lake Sonar Treatment Aquatic Vegetation Surveys and Aquatic VegetationManagement Plan Update	Spring Survey May 18, 2006 Sonar Treatment May 26, 2006 Late Season Survey August 10, 2006	Lake and River Enhancement Dewart Lake Protective Association
2007	Visual Vegetation Survey for EWM No herbicide Treatments allowed to allow native plants to re-establish Late Season Aquatic Vegetation Survey and Aquatic Vegetation Management Plan Update	Visual Survey June 13, 2007 Summer 2007 Late Season Survey August 15, 2007	Lake and River Enhancement Dewart Lake Protective Association



The following list was compiled by the IDNR and gives both common and scientific names of many plants mentioned in this report. It also gives species codes which may be referenced on some data sheets.

Table 2: Common and Scientific Plant Names

Species Code	Scientific Name	Common Name	Vegetation Type
ALGA	Any species of filamentous alga (incl. Spyrogyra, Cladophora, Hydrodictyon)	algae	N
AZO001	Azolla sp.	A mosquito fern species	N
AZOCAR	Azolla caroliniana	Carolina mosquito fern	N
AZOMEX	Azolla mexicana	Mexican mosquito fern	N
CERDEM	Ceratophyllum demersum	coontail	S
CHARA	Chara sp.	A chara species	S
EGEDEN	EGERIA DENSA	BRAZILIAN ELODEA	S
ELOCAN	Elodea Canadensis	Canada waterweed	S
ELONUT	Elodea nuttallii	western waterweed	S
HYIVER	HYDRILLA VERTICILLATA	HYDRILLA	S
LEM001	Lemna sp.	duckweeds (species within Lemnaceae)	N
LEMMIO	Lemna minor	small or common duckweed	N
LEMTRI	Lemna trisulca	star duckweed	N
LUDDEC	Ludwigia decurrens	primrose-willow	F
MYRSIB	Myriophyllum sibiricum	northern watermilfoil	S
MYRSPI	MYRIOPHYLLUM SPICATUM	EURASIAN WATERMILFOIL	S
MYR001	Myriophyllum sp.	a watermilfoil species	S
NAJFLE	Najas flexilis	slender naiad	S
NAJGRA	Najas gracillima	Northern naiad	S
NAJGUA	Najas guadalupensis	Southern naiad	S
NAJMIN	NAJAS MINOR	BRITTLE WATERNYMPH	S
NELLUT	Nelumbo lutea	American lotus	F
NITELL	Nitella sp.	a nitella species	S
NOAQVG		no aquatic vegetation at site	N
NUPADV	Nuphar advena	spatterdock	F
NUPVAR	Nuphar variegata (formerly N. luteum)	variegata (formerly N. luteum) bullhead lily (yellow pond lily)	
NYMODT	Nymphaea oderata subsp. tuberosa	white water lily (fragrant water lily)	F



Potamogeton epihydrus	ribbon-leaf pondweed	
D		S
Potamogeton foliosus	leafy pondweed	S
Potamogeton gramineus	variable pondweed	S
Potamogeton illinoensis	Illinois pondweed	S
Potamogeton foliosus, P. pusillus, or other unidentified narrow-leaved pondweeds	narrow-leaved pondweeds	S
Potamogeton nodosus (formerly P. americanus)	American pondweed	S
Potamogeton praelongus	white-stemmed pondweed	S
Potamogeton pusillus	small pondweed	S
Potamogeton richardsonii	Richardson's pondweed	S
Potamogeton zosteriformis	flat-stemmed pondweed	S
Ranunculus flabellaris	yellow water crowfoot (yellow water buttercup)	
Ranunculus longirostris (incl. R. trichophyllus)	white water crowfoot (rigid white water crowfoot)	
Riccia sp., Ricciocarpus sp.	A liverwort species	N
Spirodela polyrhiza	greater duckweed	N
Stuckenia pectinata	sago pondweed	S
	Unknown specimen No. 1	
	Unknown specimen No. 2	
Utricularia macrorhiza (also known as U. vulgaris)	common bladderwort	S
Vallisneria americana	wild celery or eel grass	S
Wolffia sp.	A watermeal species	N
Wolffia columbiana	watermeal	N
Zannichellia palustris	horned pondweed	S
Zosterella dubia (also known as Heteranthera dubia)	water stargrass	S
	Potamogeton illinoensis Potamogeton foliosus, P. pusillus, or other unidentified narrow-leaved pondweeds Potamogeton nodosus (formerly P. americanus) Potamogeton praelongus Potamogeton pusillus Potamogeton richardsonii Potamogeton zosteriformis Ranunculus flabellaris Ranunculus longirostris (incl. R. trichophyllus) Riccia sp., Ricciocarpus sp. Spirodela polyrhiza Stuckenia pectinata Utricularia macrorhiza (also known as U. vulgaris) Vallisneria americana Wolffia sp. Wolffia columbiana Zannichellia palustris Zosterella dubia (also known as Heteranthera	Potamogeton illinoensis Potamogeton foliosus, P. pusillus, or other unidentified narrow-leaved pondweeds Potamogeton nodosus (formerly P. americanus) Potamogeton praelongus Potamogeton praelongus Potamogeton pusillus Potamogeton richardsonii Richardson's pondweed Potamogeton zosteriformis flat-stemmed pondweed Potamogeton zosteriformis Ranunculus flabellaris yellow water crowfoot (yellow water buttercup) Ranunculus longirostris (incl. R. trichophyllus) Riccia sp., Ricciocarpus sp. A liverwort species Spirodela polyrhiza greater duckweed Stuckenia pectinata unknown specimen No. 1 Unknown specimen No. 2 Utricularia macrorhiza (also known as U. valigaris) Vallisneria americana wild celery or eel grass Wolffia columbiana Zannichellia palustris horned pondweed Zosterella dubia (also known as Heteranthera dubia)

Note: The scientific and common names of EXOTIC species are shown in ALL CAPITAL LETTERS.

Key to Vegetation Types: F = floating-leaved, rooted vegetation N = non-rooted floating vegetation S = submersed vegetation



2.0 Watershed and Lake Characteristics Update

Secchi depth was measured at 7.8 feet in Dewart Lake on August 15, 2007. Although water level was not measured, water level observations appeared somewhat higher than in 2006 when residents estimated that the lake was between 1 and 3 feet below normal. On August 15, 2007 Aquatic Weed Control measured dissolved oxygen and temperature throughout the water column in Dewart Lake. This data was used to construct dissolved oxygen and temperature profiles for Dewart Lake.

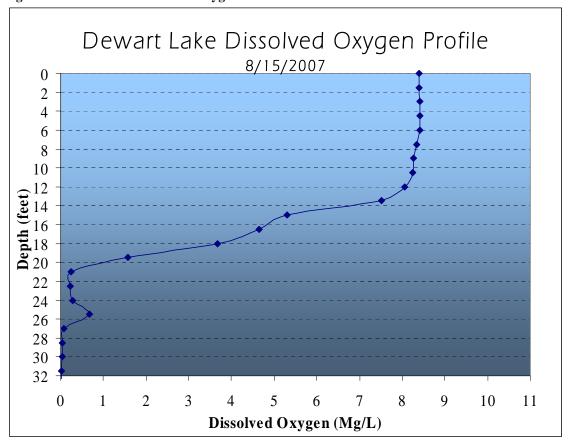


Figure 1: Dewart Lake Dissolved Oxygen Profile

Dissolved oxygen requirements to maintain healthy fish populations of warm-water species are at least 2-5 mg of oxygen per liter of water, while cold-water fish species require 5-9 mg of oxygen per liter of water (Kalff, 2002, p237).

The metalimnion is the transition zone between the surface water and the deep water. It is usually accompanied by rapid changes in dissolved oxygen and temperature. The metalimnion in Dewart Lake is between 12 and 20 feet, characterized by a rapid loss of dissolved oxygen. On August 15, 2007, Dewart Lake had adequate oxygen to support fish life down to roughly 18 feet.



Dewart Lake Temperature Profile 8/15/2007 0 2 4 6 8 10 Depth (feet)
12
14
16
18
20 22 24 26 28 30 32

Figure 2 shows water temperature data for Dewart Lake.

Figure 2: Dewart Lake Temperature Profile

The thermocline is a rapid temperature change associated with the transition from surface water to deep water. In Dewart Lake water temperature remains stable from the surface down to 14 feet. Temperature then drops rapidly with depth. This indicates a thermocline at around 14 feet.

70

Temperature (degrees F)

75

80

85

65

3.0 Lake Uses Update

55

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Lake uses have not changed significantly in Dewart Lake since the 2005 aquatic vegetation management plan.

A creel Survey was recently completed on Dewart Lake. The following paragraphs were provided as part of a fish management report by the IDNR designed to monitor conditions at Dewart Lake in response to the whole lake Sonar treatment. This is an excerpt and not the entire report.



Fish Management Report with Emphasis on Lake-Wide Application of Fluridone to Control Eurasian Watermilfoil Jed Pearson

Whether the fluridone treatment had any immediate effect on fishing at Dewart Lake was not determined. Until 2006, the only previous information on fishing activity at the lake was obtained by monitoring a bass fishing tournament on May 19, 2002. At the time, 15 anglers fished a total of 128 hours but brought only five legal-size bass to the weigh-in. All were less than 18 inches. During the 2006 creel survey, however, anglers fished 23,980 hours (44 hrs/ac) from April 3 through October 25. Of the total effort, anglers who fished on weekend accounted for 55% of the total, while anglers on weekdays accounted for 45% (Table 12). Months of greatest fishing activity were June (5843 hrs) and July (5288 hrs). Fishing effort in the spring months of April and May accounted for 7% and 15% respectively. Effort in the fall months of September and October made up 10% and 5% respectively. Summer effort in June, July and August totaled 63%. Like other area lakes, nearly all of the fishing effort came from angler fishing from boats (97%). Shore anglers accounted for only 3%.

Anglers fished mostly for bluegills and bass (Table 13). Those who targeted only bluegills accounted for 36% of the total and those who targeted only bass accounted for 32%. Another 6% fished for bluegills in combination with sunfish, 5% fished exclusively for pike, while 4% fished for bass and bluegills, and 4% fished for "anything". Less than 1% fished for walleyes. Among the total number of responses, bluegills were mentioned more often at 42%, bass second at 34%, sunfish third at 8%, pike fourth at 7%. The percentages of responses from boat anglers for these species were 41%, 34%, 8%, and 8%. Boat anglers tended to target bluegills more in the months of June (47%), July (49%) and August (49%) than other months, while bass responses were highest in April (38%), September (42%) and October (46%). Crappies were mentioned more often in April (8%). Pike were mentioned more often in April (11%) and September (12%).

Multiplying the percentage of responses from boat anglers each month times the number of boat angling hours per month provided an estimate of the monthly fishing effort directed at each species by boat anglers (Table 14). Boat anglers fished 9,705 hours for bluegills and 7,677 hours for bass. Over half of the effort directed at bluegills occurred in June (27%) and July (24%). Only 4% of the bluegill effort occurred in April, while 11% occurred in May. Among boat anglers who fished for bass, peak effort occurred in July (1,733 hrs) and accounted for 23% of the bass fishing total. Hours spent fishing for bass in April (581) and May (1,162) together accounted for another 23%, so even though the percentages of boat anglers who said they were fishing for bass in April (38%) and May (35%) were higher than percentages for other species in these months, their effort represented only 7% and 15% of the total bass effort from boat anglers. Likewise, the effort directed at pike by boat anglers was greatest in June (318 hrs), July (398 hrs), and August (369 hrs) even though as a percentage more effort was directed at pike in April (11%) or September (12%).

Anglers removed 16,266 fish during the period covered by the creel survey (Table 15). Boat anglers took 98% of them. As many as 9,848 bluegills were taken. Sunfish ranked second with 4,419, followed by crappies (538), pike (489), rock bass (312), perch (285), 31 smallmouth bass, 30 walleyes and 14 bullheads. Fishermen removed 299 largemouth bass, 10 of which were marked, and they released 8,865 bass of which 6,729 (76%) were less than 14 inches and 2,136 (24%) were legal-size. Most of the bluegills, sunfish, pike, and rock bass were taken in June.



Crappie and smallmouth bass catches peaked in July, while perch and walleye catches peaked in August. Of the 299 largemouth bass removed by anglers, 5% were taken in April, 26% were taken in May, 22% in June, 23% in July, 19% in August, 3% in September, and 2% in October. The highest number of releases occurred in July (26%). Only 7% of the releases were made in April and 19% were made in May. Shore anglers took home mostly bluegills and sunfish.

Harvested bluegills ranged in length from 4.0-9.5 inches (Table 16). The largest percentage (29%) was 7.5 inches. Another 22% were 8-inch or larger. Harvested crappies were 7.0-14.5 inches, with 10 inches the dominant size. Sunfish, mostly redear, were 5.0-12.0 inches, of which 69% were 8-inch and larger. Perch were mostly 7.0-8.5 inches and rock bass were mostly 8.0-9.0 inches. All pike observed by the creel clerk were legal-size (20-in or larger). They ranged up to 37 inches long. Those less than 30 inches accounted for 89% and those 30 inches or larger accounted for 11%. Harvested walleyes were 14.5-23.5 inches. Of the 299 largemouth bass taken home, all but four were legal-size (14 in). Of all legal bass, 59% were less than 16 inches and only 4% were 18-inch or larger. The remaining 37% were 16.0-17.5 inches. The 295 legal-size largemouth bass removed by anglers represented 44% of the original 672 estimated to be present in spring. This figure, however, may be high since some bass less than 14 inches long probably grew into the legal-size range during the period covered by the survey and were taken by anglers. On the other hand, only 10 legal bass (7%) were taken by anglers out of the 134 marked and released into the population. Small sample size and failure to note marked bass in the creel could have biased this figure, however. In contrast, the catch-and-release of 8,865 bass represented more than twice the estimated number (3,578) of all 8-inch and larger bass in the lake. With annual survival of age-5 and older bass estimated at 31%, total annual mortality would be 69%. Assuming fishing mortality was a high as 44%, another 25% of the adult bass population (age-5 and older) could be lost each year to natural causes and delayed mortality due to angler catch-and-release. If fishing mortality is indeed as low as 7%, unexplained mortality could be as high as 62%.

Anglers were generally satisfied with fishing quality (Table 17). Overall, 74% of the responses of interviewed anglers were 'good', 20% were 'fair', and 6% were 'poor' when asked to describe fishing quality at Dewart Lake. Similar percentages of anglers rated bluegill and bass fishing as good (72-73%), while similar percentages (6-7%) of both groups rated fishing as poor. Anglers who specifically targeted only bluegills harvested them at the rate of 0.78 per hour. Those who considered fishing 'good' (70%) harvested them at the rate of 0.93 per hour and those who considered fishing 'poor' harvested them at 0.50 per hour. Of the 420 interviewed parties (835 anglers) who sought only bluegills, 202 parties (48%) representing 385 individuals (46%) took home none. In contrast, only four fishermen in three parties (<1%) kept 25 or more bluegills, per angler including only one person who took home more than 25. Forty-three parties (10%) kept 10 or more bluegills per angler. Those who fished specifically for bass caught them at the rate of 0.89 per hour but took home only one bass per 111 hours of fishing. Their catch rate of sub-legal bass was 0.55 per hour. Most anglers who fished only for bass rated fishing as 'good' (72%) and only 5% rated fishing as 'poor'. Northern pike were even more satisfied, with 80% of the responses 'good' and only 4% 'poor'. Crappie anglers were less satisfied with fishing quality (68% good, 10% poor) and perch anglers and anglers who fished for "anything" were least satisfied.

Prior to the fluridone application, anglers had mixed opinions on whether there were "too many weeds" in Dewart Lake, but no one thought so afterwards (Table 18). From April through June, the percentage of anglers who thought there were too many weeds varied from 31-40% per month, while the percentage who did not varied from



47-59%. About 10-13% were unsure. The percentage of anglers who thought there were too many weeds dropped to 16% in July, 3% in August, and to 0% by September. The percentage who did not think there were too many weeds increased to 75% in July, 96% in August, and 100% by September. Before treatment, lake residents were more likely to think there were too many weeds than lake visitors. Visitors were also less certain there were too many weeds. By August, there were no differences in opinions between residents and visitors.

Perceptions of a weed problem varied with angler preferences. Among boat anglers overall, those who fished for 'anything' or crappies were more likely (35-36%) to think there were too many weeds in the lake (Table 19). Bluegill and sunfish anglers were less likely (20-27%), while bass and pike anglers were the least likely to think there were too many weeds (11-15%). However, these figures do not take into account their reaction to the decline in vegetation associated with the fluridone application throughout the season. For example, bluegill anglers in April, May and June were initially more likely to say there were too many weeds than did bass or pike anglers, but by August, September and October even bluegill anglers agreed there were no longer too many weeds in the lake (Table 20). Angler perceptions of a weed problem were not related to their perceptions of fishing quality (Table 21).

4.0 Fisheries Update

A new fisheries survey was recently completed on Dewart Lake. The following paragraphs were provided as part of a fish management report by the IDNR designed to monitor conditions at Dewart Lake in response to the whole lake Sonar treatment. The following paragraphs are excerpts and not the entire report.

Fish Management Report with Emphasis on Lake-Wide Application of Fluridone to Control Eurasian Watermilfoil Jed Pearson

"As expected, given the May application of the fluridone treatment and the unlikelihood of any immediate impact, results of the June and July fish population surveys were similar to results obtain in previous years (Table 5). Bluegills have consistently ranked first by number in survey catches dating back to 1976. Largemouth bass, redear and yellow perch have also been the major sport species over the years. The most notable change in relative abundance of various species, however, has been the appearance and eventual increase of northern pike after 1982. Fifty-nine pike, weighing 144 pounds, were caught during the 2006 sampling. Pike accounted for 26% of the total survey weight. The gill net catch rate increased from 4.3/lift in 1995 to 6.8/lift in 2003 and 7.3/lift in 2006. As pike abundance increased, smallmouth bass and walleyes were also stocked, although only two smallmouth bass and seven walleyes were captured in the 2006 survey. The overall weight of large predators (including largemouth bass, gar and bowfin) increased from an average of 38% in 1976 and 1982 to 60% in 1995 to 2006, even though they accounted for only 9-13% by number.

A total of 1,159 bluegills were sampled during the 2006 survey, ranging in length from 1.7-8.5 inches. Mean length of bluegills in the July 2006 catch was 3.5 inches, down from 5.3 in 1976 and 5.0 in 1982, but also down from 3.9 and 4.0 in 1995 and 2003, indicating bluegill size may have declined over the past 30 years, although prior to 1995 (Table 6). From 1995 through 2006, DC electrofishing catch rates (123-134/15-min) and size structure indices of bluegills, however, have been relatively stable. Less than 1% of all 3-inch and larger bluegills have been 8-inch or larger.



The 152 largemouth bass collected during the June and July sampling ranged in size from 2.5-17.5 inches (Table 7). Although 10 were 14.0-14.5 inches, only one was larger at 17.5 inches. Of all bass 8 inches and larger, 15% were 14-inch or larger. The percentage was slightly greater in June (16%) than July (12%). The proportion of 14-inch and larger bass in July 2006 (12%) was within the range of values from 1976 through 2003 (6-18%). Mean length in 2006 (4.7 in) was also similar to mean lengths in previous surveys. Although no 18-inch or larger bass were captured during the 2006 survey, very few were caught in earlier surveys as well. Only two were captured in 1995 and one was caught in 2003.



5.0 Problem Statement

Eurasian watermilfoil no longer dominates the Dewart Lake plant community. The challenge in 2008 will be to identify areas of EWM re-growth through proper vegetation survey techniques and manage them effectively with herbicide treatments. Since some EWM re-growth is expected in 2008, spot treatments using 2, 4-D will likely be used to manage these smaller areas, as opposed to a whole lake treatment.

6.0 Management Goals and Objectives

The management goals outlined by the IDNR Division of Fish and Wildlife have not changed. They are restated below:

- 1. Develop or maintain a stable, diverse aquatic plant community that supports a good balance of predator and prey fish and wildlife species, good water quality and is resistant to minor habitat disturbances and invasive species.
- 2. Direct efforts to preventing and/or controlling the negative impacts of aquatic invasive species.
- 3. Provide reasonable public recreational access while minimizing the negative impacts on plant and wildlife resources.

Specific Objectives

The major objective for Dewart Lake has changed from a large scale treatment effort to reduce the dominant milfoil population, to smaller scale treatments in areas where regrowth is observed in the future. One specific measurable goal would be to keep Eurasian watermilfoil infestation below 25 acres in 2008. This is not a guarantee but a guideline for expectations based on results of other whole lake Sonar treatments.

Ideally we would like to see an increase in site frequency for coontail as well. The longevity of control for Eurasian watermilfoil in Dewart Lake has surpassed expectations, as it was expected to return to Dewart Lake in fall of 2007. Rapid re-colonization of previously infested areas with native plants has also surpassed expectations. In 2007 sago pondweed was very abundant in areas previously occupied by Eurasian watermilfoil. However, coontail experienced a large decline in site frequency from 2006 to 2007. Its population should be monitored to see how it responds to the treatment over time.

The curly leaf pondweed population should also be monitored. The removal of Eurasian watermilfoil could possibly trigger an increase in its abundance, as could the suspension of treatments on the main lake in the area where it is most abundant (Blueberry Island frontage).



7.0 Plant Management History Update

District 3 Biologist Jed Pearson was contacted to determine any significant changes to Aquatic vegetation control permits. The only significant change to permits was the whole lake Sonar treatment. No herbicide treatments have been permitted on the main lake since the Sonar treatment. Spot treatments for EWM were permitted for 2007 but were not needed since EWM did not return to the lake in 2007.

The only area treated in Dewart Lake in 2007 was in the channel system encircling Blueberry Island in the southeast end of the lake. This channel was treated for algae only in 2007. Figure 3 shows this area.



8.0 Aquatic Plant Community Characterization Update

One major change in protocol for 2007 is the absence of the Tier I reconnaissance survey. Survey intensity is now being tailored to individual lakes, depending on their own unique set of circumstances and management activities. Some lakes which may have been surveyed twice annually in the past may only be surveyed once each season. Surveys on some lakes that have been intensely surveyed in recent years may change to visual surveys as opposed to more time consuming quantitative vegetation surveys. These changes provide better quality of service and more efficient use of funding on Indiana



lakes. An updated Tier II survey protocol has been established by the IDNR. These changes are outlined in the methods section (8.1).

8.1 Methods Update

The Tier II survey protocol was updated by the IDNR in 2006 and 2007. The 2006 Tier II protocol requires that sample sites be stratified by depth contour, and that data analysis be provided for each depth contour. Rake scores for plant species are recorded as 1, 3, or 5, as opposed to the original scoring system of 1, 2, 3, 4, or 5.

The number of sample sites needed for a Tier II survey still is based lake size as it was in 2006. Trophic state describes the productivity of a lake and is correlated with plant growth, secchi disk, and nutrient availability. There are 4 different trophic states listed by the IDNR: Oligotrophic, Mesotrophic, Eutrophic, and Hypereutrophic. Oligotrophic Lakes usually have clear water and few nutrients, while hypereutrophic lakes usually have deeply stained water and are nutrient rich. Table 3 is taken from the IDNR 2006 Tier II protocol and shows the maximum depth that must be sampled for a lake in each trophic state. In oligotrophic lakes, where water is clear, plants may be able to grow in up to 25 feet of water because sunlight may still reach the lake bottom in deep water. In hypereutrophic lakes where water is turbid, lack of sunlight will prevent plants from growing in deep water, so the maximum sampling depth is only 10 feet.

Table 3: Sample Depth by Trophic State

Trophic State	Maximum Depth of Sampling (ft)
Hypereutrophic	10
Eutrophic	15
Mesotrophic	20
Oligotrophic	25

Table 4 is used to calculate the number of sample sites need in each depth contour by using lake size and trophic status. The new protocol attempts to more accurately describe the entire littoral zone of a lake and provide more detailed data analysis by separating the littoral zone into 5 foot depth segments.

Table 4: Sample Sites by Lake Size and Trophic State

							Tier II Sa	mpling							3
Γable 3.	Sample	size requir			d by lake si Eutrophic		state, and	apportione Mesoti		class.		0	ligotroph	ic	
Lake Acres	Total # of Sites	0-5 foot contour	5-10 foot contour	0-5 foot contour	5-10 foot contour	10-15 foot contour	0-5 foot contour	5-10 foot contour	10-15 foot contour	15-20 foot contour	0-5 foot contour	5-10 foot contour	10-15 foot contour	15-20 foot contour	20-25 foot contour
<10	20	10	10	10	7	3	10	5	3	2	10	4	3	2	No.
10-49	30	20	10	10	10	10	10	10	7	3	10	10	5	3	
50-99	40	30	10	17	13	10	10	10	10	10	10	10	10	7	
100-199	50	40	10	23	17	10	14	14	12	10	10	10	10	10	1
200-299	60	50	10	30	20	10	18	16	16	10	14	12	12	12	1
300-399	70	60	10	37	23	10	22	20	18	10	17	15	14	14	
400-499	80	70	10	43	27	10	25	23	22	10	19	18	17	16	
500-799	90	80	10	50	30	10	29	27	24	10	22	21	19	18	
>=800	100	90	10	57	33	10	33	31	26	10	25	23	22	20	

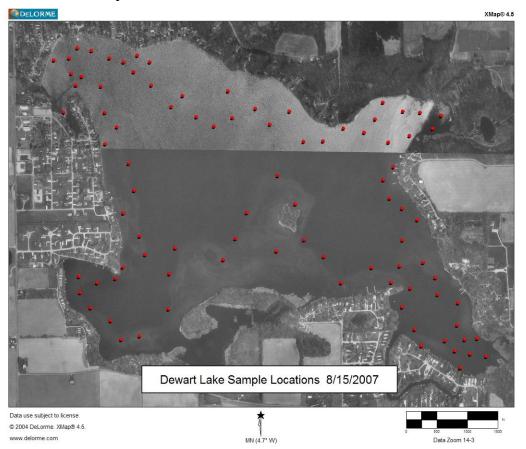


Dewart Lake is characterized by the IDNR as mesotrophic with 551 surface acres. Based on these characteristics, 90 sample sites are distributed between the 5 foot depth contours of the littoral zone of Dewart Lake. At this time, the current sampling strategy for Dewart Lake appears adequate, and no changes are recommended for 2008.

8.2 Tier II Results

Secchi depth was measured at 7.8 feet in August 15, 2007 Tier II survey. Based on Dewart Lake's classification as mesotrophic and its 551 surface acres, ninety rake samples were divided between each 5 foot depth contour of the littoral zone. A total of 13 species of submersed aquatic plants were collected during this survey. The following map shows the locations of all sample sites during the 2007 Tier II survey. Sample locations are the same as 2006 and are stratified by depth contour. Figure 4 shows the 2007 rake sample locations.

Figure 4: 2007 Rake Sample Locations





Tier II Data Analysis

Flat-stemmed Pondweed

American Pondweed

Leafy Pondweed

Filamentous Algae

Nitella

3.3

2.2

1.1

1.1

10.0

The following tables are data summaries for the 2007 aquatic vegetation survey. These tables help to describe the plant community, and will help identify any changes that take place in the years to come. Tables labeled "Overall" include every sample site in the survey, while the other tables describe each 5 foot depth contour of the lake's littoral zone (0-5 feet, 5-10 feet, etc).

In the data analysis tables, "littoral sites" indicates the number of sample sites which had a depth that was less than the maximum depth at which plants were found. The littoral depth indicates the maximum depth at which plants were found.

Table 5: Aug	Table 5: August 2007 Data Analysis - Overall								
	Occurrence and	l Abundance of Submer	sed Aquatic Plan	ts - Overall					
Lake:	Dewart Lake	Secchi:	7.8	SE Mean Species/site:	0.13				
Date:	8/15/07	Littoral sites with plants:	61	Mean natives/site:	1.31				
Littoral depth (ft):	14.0	Number of species:	13	SE Mean natives/site:	1.12				
Littoral sites:	79	Maximum species/site:	4	Species diversity:	0.79				
Total sites:	90	Mean number species/site:	1.34	Native diversity:	0.78				
			Caona Engaranas	l					
	Site		Score Frequency						
Common Name	Frequency	1	3	5	Dominance				
Chara	51.1	10.0	25.6	15.6	32.9				
Sago Pondweed	28.9	5.6	7.8	15.6	21.3				
Water Stargrass	13.3	3.3	7.8	2.2	7.6				
Curly-leaf Pondweed	8.9	7.8	1.1	0.0	2.2				
Slender Naiad	6.7	5.6	1.1	0.0	1.8				
Coontail	5.6	0.0	5.6	0.0	3.3				
Large-leaf Pondweed	4.4	2.2	2.2	0.0	1.8				
Small Pondweed	4.4	4.4	0.0	0.0	0.9				
Brittle Naiad	3.3	2.2	0.0	1.1	1.6				

1.1

2.2

1.1

1.1

2.2

0.0

0.0

0.0

0.0

0.0

0.0

0.0



1.6

0.4

0.2

0.2

Table 6: August 2007 Data Analysis 0 - 5 Feet

Occurrence and Abundance of Submersed Aquatic Plants 0-5 Feet								
Lake:	Dewart Lake	Secchi:	7.8	SE Mean Species/site:	0.16			
Date:	8/15/07	Littoral sites with plants:	29	Mean natives/site:	1.69			
Littoral depth (ft):	14.0	Number of species:	11	SE Mean natives/site:	0.13			
Littoral sites:	29	Maximum species/site:	4	Species diversity:	0.71			
Total sites:	29	Mean number species/site:	1.69	Native diversity:	0.71			

			Score Frequency		
	Site				
Common Name	Frequency	1	3	5	Dominance
Chara	86.2	0.0	41.4	44.8	69.7
Waterstargrass	17.2	6.9	6.9	3.4	9.0
Large-leaf Pondweed	13.8	6.9	6.9	0.0	5.5
Sago Pondweed	13.8	10.3	3.4	0.0	4.1
Coontail	10.3	0.0	10.3	0.0	6.2
Curly-leaf Pondweed	6.9	6.9	0.0	0.0	1.4
Small Pondweed	6.9	6.9	0.0	0.0	1.4
Flat-stemmed Pondweed	3.4	0.0	3.4	0.0	2.1
American Pondweed	3.4	3.4	0.0	0.0	0.7
Leafy Pondweed	3.4	3.4	0.0	0.0	0.7
Nitella	3.4	3.4	0.0	0.0	0.7
Brittle Naiad	0.0	0.0	0.0	0.0	0.0
Filamentous Algae	10.3				



Table 7: August 2007 Data Analysis 5 - 10 Feet

O	ccurrence and	Abundance of Submers	ed Aquatic Plan	ts 5-10 Feet	
			1		
Lake:	Dewart Lake	Secchi:	7.8	SE Mean Species/site:	0.24
Date:	8/15/07	Littoral sites with plants:	21	Mean natives/site:	1.63
Littoral depth (ft):	14.0	Number of species:	9	SE Mean natives/site:	0.21
Littoral sites:	27	Maximum species/site:	4	Species diversity:	0.78
Total sites:	27	Mean number species/site:	1.74	Native diversity:	0.75
			Score Frequency		
Common Name	Site Frequency	1	3	5	Dominance
Chara	59.3	22.2	33.3	3.7	28.1
Sago Pondweed	48.1	0.0	11.1	37.0	43.7
Slender Naiad	22.2	18.5	3.7	0.0	5.9
Water Stargrass	11.1	0.0	11.1	0.0	6.7
Brittle Naiad	11.1	7.4	0.0	3.7	5.2
Curly-leaf Pondweed	11.1	11.1	0.0	0.0	2.2
Coontail	3.7	0.0	3.7	0.0	2.2
Flat-stemmed Pondweed	3.7	0.0	3.7	0.0	2.2
Small Pondweed	3.7	3.7	0.0	0.0	0.7
Filamentous Algae	3.7				

Table 8: August 2007 Data Analysis 10 - 15 Feet

Occurrence and Abundance of Submersed Aquatic Plants 10-15 Feet								
Lake:	Dewart Lake	Secchi:	7.8	SE Mean Species/site:	0.29			
Date:	8/15/07	Littoral sites with plants:	11	Mean natives/site:	1.04			
Littoral depth (ft):	14.0	Number of species:	8	SE Mean natives/site:	0.29			
Littoral sites:	23	Maximum species/site:	4	Species diversity:	0.78			
Total sites:	24	Mean number species/site:	1.04	Native diversity:	0.78			
			G . F					
	C!!4 -		Score Frequency					
Common Name	Site Frequency	1	3	5	Dominance			
Sago Pondweed	37.5	8.3	12.5	16.7	25.8			
Chara	20.8	12.5	8.3	0.0	7.5			
Water Stargrass	16.7	4.2	8.3	4.2	10.0			
Curly-leaf Pondweed	12.5	8.3	4.2	0.0	4.2			
Coontail	4.2	0.0	4.2	0.0	2.5			
American Pondweed	4.2	4.2	0.0	0.0	0.8			
Flat-stemmed Pondweed	4.2	4.2	0.0	0.0	0.8			
Small Pondweed	4.2	4.2	0.0	0.0	0.8			
Filamentous Algae	20.8							



No plants were found deeper than 14 feet in 2007.

Table 9 was provided by District 3 Fisheries Biologist Jed Pearson and provides a comparison of recent survey data from both the IDNR and Aquatic Weed Control. Data was similar between surveys, showing Eurasian watermilfoil, chara and coontail all being frequently collected before the whole lake Sonar treatment.

Table 9: Dewart Lake Survey Comparison

			Dewart La	ke 3-year s	ummary					
Parameter (0-20 ft) Date	AWC 7/27/05			DFW 5/24/05	The state of the state of			DFW 7/31/06	8/1/07	Target
Sample sites (n)	80 13.0	90 8.0	90 7.8	106 21.0	90 22.0	90 13.0	102 7.5	90 11.0	90	90 10.0
Secchi (ft)	19.0	20.0	14.0	26.5	19.0	20.0	21.0	20.0	17.0	20.0
Littoral depth (ft) Coverage (%)	93.8	83.3	87.8	96.2	92.2	87.8	100.0	88.9	85.6	>80.0
Native coverage (%)	50.0	00.0	01.0	94.3	75.6	55.6	97.1	88.9	83.3	>80.0
Species (N)	13	11	13	12	11	9	17	10	12	13
Native species (N)	11	10	12	10	9	8	15	9	11	13
Species/site (max)	7	5	4	6	4	4	6	3	4	5
Species/site (mean)	2.14	1.18	1.34	2.35	1.98	1.18	2.49	1.14	1.64	2.00
Native species/site (mean)	1.78	1.10	1.31	1.46	0.94 0.79	0.69	1.87 0.85	1.12 0.72	1.40 0.79	1.50 0.80
Species diversity	0.84 0.80	0.77 0.74	0.79 0.78	0.85 0.82	0.79	0.73 0.72	0.83	0.72	0.79	0.80
Native species diversity										
Species occurrence (%)	2005 35.0	2006	2007	2005 56.6	2006 67.8	2007	2005 59.8	2006	2007	Target
Eurasian water milfoil Chara	65.0	33.3	51.1	40.6	23.3	30.0	51.0	37.8	56.7	
Coontail	15.0	43.3		34.0	41.1	5.6	43.1	43.3	12.2	
Water stargrass	40.0	11.1	13.3		5.6	5.6	18.6	16.7	16.7	
Common naiad	18.8 12.5	4.4	6.7 28.9	9.4	2.2 10.0	17.8	18.6 12.7	2.2	5.6 35.6	
Sago pondweed Illinois pondweed	23.8	4.4			10.0	17.0	11.8		1.1	
Variable pondweed				5.7	6.7	1.1	13.7	2.2	2.2	
Elodea	1.3			1.9			3.9			
Long-leaf pondweed Large-leaf pondweed	5.0	3.3	4.4	15.1	2.2	4.4	5.9	2.2	3.3	
Floating-leaf pondweed	0.0	0.0	•••				1.0		0.0	
Flat-stem pondweed	22.5	2.2		21.7	2.2	1.1	2.9	5.6	04.4	
Curly-leaf pondweed Bladderwort	1.3	7.8	8.9	32.1 0.9	35.6	48.9	2.0 1.0	2.2	24.4	
Eel grass	5.0	1.1		3.8			1.0	1.1	1.1	
Leafy pondweed			1.1	- 5000000			1.0			
Northern water milfoil	6.2	4.4	2.2	13.2			1.0			
American pondweed Whorled water milfoil	6.3 2.5	4.4	2.2							
Spiny naiad			3.3						4.4	
Nitella		2.2			1.1	3.3		1.1	1.1	
Small pondweed Filamentous algae			4.4 10.0	17.0	12.2	34.4	9.7	12.2	12.2	
Species dominance Eurasian water milfoil	2005 16.8	2006	2007	2005 29.8	2006 44.7	2007	2005 37.1	2006	2007	Target
Chara	41.5	29.3	32.9	18.7	10.9	10.4	36.5	23.1	28.7	
Coontail	3.5	22.9		10.9	18.4		24.7	17.6	2.9	
Water stargrass	6.5	5.8	7.6 1.8	1.9	1.1 0.9	1.1	8.8 5.7		6.4 1.1	
Common naiad Sago pondweed	2.8	1.3		1.5	2.0	4.4	5.7		19.1	
Illinois pondweed	6.0	0.9					4.3		0.2	
Variable pondweed	0.0			1.1	1.3	0.2	3.9		0.4	
Elodea Long-leaf pondweed	0.3			1.1 3.4			2.4			
Large-leaf pondweed	1.5	2.0	1.8	0.1	1.3	0.9	2.7	0.4	1.6	
Floating-leaf pondweed	2.2	100	*-				1.0			
Flat-stem pondweed	5.3 0.5	0.4 1.6		7.0 12.5			1.0 0.4		5.3	
Curly-leaf pondweed Bladderwort	0.5	1.0	2.2	0.2		24.0	0.4		0.0	
Eel grass	1.0	0.2		1.1			0.2		2.5	
Leafy pondweed			0.2	20			0.2		0.2	
Northern water milfoil American pondweed	3.3	0.9	0.4	2.6			0.2			
Whorled water milfoil	0.5	0.0	0.4							
Spiny naiad		202	1.6					0.0	0.9	
Nitella		1.8	0.2		0.7	1.1		0.2	0.2	



Site Frequency

Site frequency is a measure of how often a species was collected during the Tier II survey. It can be calculated by the following equation:

Site Frequency = (# of sites where the species was collected) X 100 Total # of littoral sample sites

Table 10 shows overall site frequencies for each plant collected in the 2007 Tier II vegetation survey. Chara was the most frequently collected species, followed by sago pondweed and water stargrass. Eurasian watermilfoil was not found in Dewart Lake in 2007.

Table 10: 2007 Site Frequencies

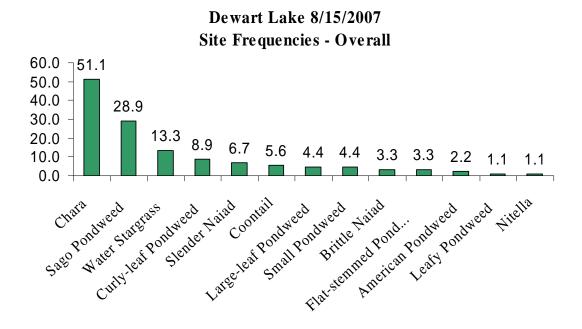
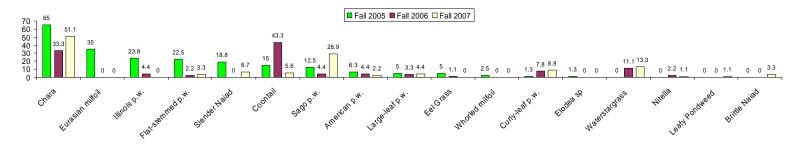


Table 11 shows site frequencies for every plant collected in fall 2005 (pre-treatment) or fall 2006 or 2007 (post treatment). Tier II survey protocol was changed in 2006, shifting more sample sites to deep water, and that change should be taken into consideration when viewing this information. Some plants like coontail and sago pondweed appear to de found more frequently in depths of 6-10 feet than in depths of 0-5 feet. Before the change in protocol, Aquatic Weed Control took more sample sites in 0-5 feet of water. The most significant changes over this 3 year period have been in the coontail and sago pondweed populations. Coontail frequency has diminished after treatment, while sago pondweed frequency has increased after the Sonar treatment.



Table 11: Dewart Lake Site Frequency History

Dewart Lake Site Frequency Changes 2005-2007



Species Diversity

The species diversity indices listed in data analysis tables help to describe the overall plant community. A species diversity index is actually measured as a value of uncertainty (H). If a species is chosen at random from a collection containing a certain number of species, the diversity index (H) is the probability that a chosen species will be different from the previous random selection. The diversity index (H) will always be between 0 and 1. The higher the H value, the more likely it is that the next species chosen from the collection at random will be different from the previous selection (Smith, 2001). This index is dependent upon species richness and species evenness, meaning that species diversity is a function of how many different species are present and how evenly they are spread throughout the ecosystem.

The overall species diversity index for Dewart Lake in late season 2007 was 0.79, up slightly from 0.77 in 2006. Native plant diversity in late season of 2007 was less than the overall species diversity at 0.78, meaning invasive species (curly leaf pondweed, and brittle naiad) accounted for some of the diversity in Dewart Lake.

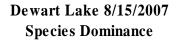
Species Dominance

Species dominance is dependent upon how many times a species occurs, and its relative coverage area or biomass within the system. In this survey, the abundance rating given to each species at each sample site was used to determine dominance. The dominance of a particular species in this Tier II survey increases as its site frequency and relative abundance increase.

Table 12 shows dominance scores for all plants collected in the 2007 Tier II aquatic vegetation survey. Chara had the highest dominance score, followed by sago pondweed and water stargrass. Coontail dominance dropped sharply from 22.9 in 2006, to 3.3 in 2007.



Table 12: 2007 Species Dominance



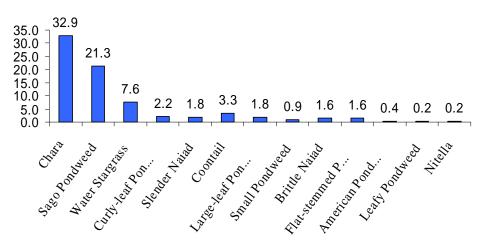
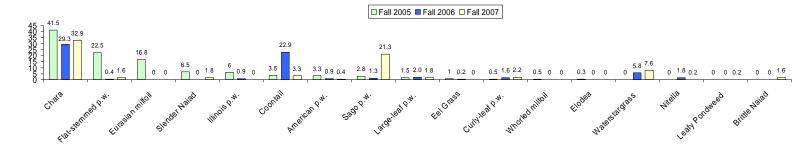


Table 13 tracks dominance values for each plant collected at Dewart Lake during its involvement in the LARE program. Trends are similar to sight frequency, with Eurasian watermilfoil dominance dropping to 0 after the Sonar treatment and remaining at 0 through the 2007 growing season.

Table 13: Dewart Lake Plant Dominance History

Dewart Lake Plant Dominance Values 2005-2007



8.3 Macrophyte Inventory Discussion

The submersed plant community of Dewart Lake covers roughly 260 acres of the lake, or 47% of the lake's total surface area. Eurasian watermilfoil was dominant in about 140 of these acres before the Sonar treatment. After treatment, Eurasian watermilfoil was reduced to the point that it was undetectable in fall of 2006 and 2007. After treatment in 2006, slight reductions were seen in overall species richness and plant diversity, and populations of some native plants were reduced. In 2007, species richness increased to 13 species and many native populations were increasing. Sago pondweed increased rapidly in areas previously infested by EWM. Its site frequency increased from 4.4 in 2006, to 28.9 in 2007. Coontail showed a large decrease in site frequency from 43.3 % in



2006 to just 5.6% in 2007. It is hoped that coontail frequency will increase in 2008, along with other pondweeds that experienced frequency declines after the sonar treatment.

The curly leaf pondweed population in Dewart Lake should also be monitored. Curly leaf pondweed abundance increased from 1.3% in 2005 to 7.8% in 2006, to 8.9% in 2007. Curly leaf pondweed is most abundant along the frontage of Blueberry Island, which was privately treated up until the whole lake Sonar treatment. The removal of Eurasian watermilfoil could possibly trigger an increase in its abundance, as could the suspension of treatments on the main lake in the area where it is most abundant (Blueberry Island frontage).

Thirteen species were collected in Dewart Lake in 2007 and species diversity was 0.79. Native plant species such as sago pondweed, slender naiad, and water stargrass have increased in abundance since 2006. Curly leaf pondweed, an invasive plant species also showed a minor site frequency increase (7.8 to 8.9) since 2006.

Although EWM was not found in 2007, some re-growth is expected in 2008 based on observations from other whole lake Sonar treatments in northern Indiana. The plant community should continue to be monitored to identify any areas of EWM re-growth.

Threatened and Endangered Species

The Indiana Natural Heritage Data Center is part of the <u>Natural Heritage Network</u>, a worldwide system of Heritage Programs. This program is designed to provide information about Indiana's diversity of natural ecosystems, species, landscape features, and outdoor amenities, and to assure adequate methods for evaluating this information and setting sound land protection priorities. The inventory is a continuous attempt to determine the state's most significant natural areas through an intensive statewide inventory.

The Indiana Natural Heritage Data Center has compiled a list of Indiana plant species that are federally or state listed as endangered, threatened or rare. The following is an excerpt taken directly from the Indiana Natural Heritage Database website. Link: Indiana I

"The Indiana Natural Heritage Data Center, set up in 1978, represents a comprehensive process, becoming an increasingly valuable tool for decision makers and scientists as it progresses."

No state or federally listed plant species were found in Dewart Lake in 2007.



9.0 Aquatic Vegetation Management Alternatives

Major Eurasian watermilfoil control practices have not changed significantly from the 2005 Alternatives.

Renovate and 2, 4-D Treatments: The differences between Renovate and 2, 4-D treatments for Eurasian watermilfoil are still being documented. Both of these herbicides are commonly used for spot treatments of Eurasian watermilfoil. They are both systemic herbicides, meaning they are translocated from the foliage of the plant into the root system. Renovate is more expensive than 2, 4-D, although the chemistries of the two products are very similar. The justification for the extra expense is that Renovate is said to have the potential for multiple years of control on Eurasian milfoil. It is also said that Renovate may have less impact on native species like coontail. However, in Aquatic Weed Control's experience these characteristics of Renovate have not been documented. Both provide very effective, year long control of Eurasian watermilfoil.

10.0 Public Involvement

A LARE meeting was held on November 8, 2007 to discuss issues pertaining to Dewart Lake. District 3 Fisheries Biologist Jed Pearson, a lake representative, Aquatic Weed Control and LARE Aquatic Biologist Angela Sturdevant were all present and discussed the plant community of Dewart Lake.

A public lake meeting was held for Dewart Lake on June 10, 2007, Thirty one people were in attendance. Jim Donahoe of Aquatic Weed Control summarized LARE management activities and outlined the future management strategy for maintaining the Eurasian watermilfoil population at a low level with spot herbicide treatments. A summary of responses to the public questionnaire are shown in table 14. Residents were pleased with the outcome of the Sonar treatment, and most were supportive of the current management strategy. Residents are becoming concerned about surveying and planning effort and cost. They were concerned that the costs for intensely surveying the lake and updating the management plan each year may not be the best use of limited association funds.

The Dewart Lake Association is active, and lake association meetings help to keep the public informed about management practices on Dewart Lake. Other avenues that may be used to inform the public would be periodic newsletters, an email list, an association website, or posting signs at public access sites.



Table 14: Public Questionnaire

Lake Use Survey (31 total) Lake name Dewart Lake
Are you a lake property owner? Yes 31 No 0
Are you currently a member of your lake association? Yes <u>26</u> No <u>3</u>
How many years have you been at the lake? 2 or less-1 2 - 5 years - 1 5-10 years - 2 14 Over 10 years - 2 14
How do you use the lake (mark all that apply) 24 Swimming 28 Boating 1 Drinking water 1 Other
Do you have aquatic plants at your shoreline in nuisance quantities? Yes $\frac{1}{2}$ No $\frac{1}{2}$
Do you currently participate in a weed control project on the lake? Yes R No 11
Does aquatic vegetation interfere with your use or enjoyment of the lake? Yes $\underline{\mathbb{Q}}$ No $\underline{\mathbb{Q}}$
Does the level of vegetation in the lake affect your property values? Yes $\underline{10}$ No $\underline{19}$
Are you in favor of continuing efforts to control vegetation on the lake? Yes 30 No 1
Are you aware that the LARE funds will only apply to work controlling invasive exotic species, and more work may need to be privately funded? Yes 26 No 5
Mark any of these you think are problems on your lake: 11 Too many boats access the lake 20 Use of jet skis on the lake 20 Too much fishing 5 Fish population problem 9 Dredging needed 9 Overuse by nonresidents 5 Too many aquatic plants 0 Not enough aquatic plants 4 Poor water quality 7 Pier/funneling problem
Please add any comments: See Next page

Dewart Lake Public Written Comments – June 10, 2007

The following comments were written public questionnaires at the association meeting on June 10, 2007.

Remove northern Pike.

Lake Patrol, water skiing after sunset with no observer.

High speed boating next to shore.

Speed Restrictions around Scout Camp

Cattails in front of Dock on South Side. (continued on next page)



Dredge South Side due to not being able to get boats out.

Need to control skiers and jet skis to protect shoreline.

There needs to be more control of the number of boats at the public access. The DNR needs to respond to <u>every</u> inquiry about easement encroachment! They need to not be afraid of investigating all inquiries. Called three DNR officers and never received a response.

Clear, clean water is a concern of mine.

Need to have rules to control use of jet skis on the lake.

Water quality is not as good as 5 years ago.

Lake front property owners are covering the entire shoreline with piers.

Need Eco-Zone of South Side.

Reeds are disappearing and bottom of lake scouring.

Private piers need to be limited.

People don't follow the law.

Ski Boats and jet skis too close to shore.

Too high speed wave runners, need more evening lake patrol-skiing without observer. Boating too close to shore, even with bouys.

Need no wake zone in northeast corner around scout camp and is causing <u>shoreline</u> <u>erosion</u>.

Scout camp is a great neighbor and would help to have a great area for pontoon and boat anchoring for swimming and relaxation! And safety for campers and swimmers. Boats high speed <u>disregard everyone!</u> Thanks.



11.0 Public Education

The Dewart Lake Association has been very aggressive in preventing the spread of invasive aquatic vegetation. They have privately helped to fund herbicide treatments and have submitted a proposal to the LARE program for additional herbicide treatment of Eurasian watermilfoil. This proposal resulted in the whole lake Sonar treatment.

More information on stopping the spread of invasive aquatic organisms can be found at http://www.protectyourwaters.net/. These items include thoroughly cleaning equipment after use in a lake and removing all water from bilges, livewells, etc.

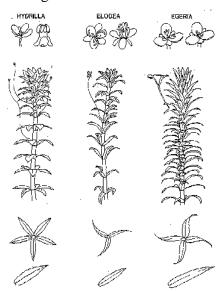
11.1 Hydrilla

Hydrilla (Hydrilla verticillata) is an invasive aquatic plant species common throughout the



southern United States. It is federally listed as a noxious weed and causes severe ecological and recreational problems wherever it grows. It is considered to be much more destructive than other invasives like Eurasian watermilfoil and curly leaf pondweed because of its reproductive adaptations. It grows by fragmentation, as does Eurasian watermilfoil, but it also produces turions which can remain dormant in the sediment for 4 years or more (Van and Steward, 1990). It produces tubers at its root tips which can also reproduce after multiple years of dormancy. It can grow 1 inch each day and it quickly out-competes native plants. It forms dense beds that eliminate native plants, stunt fish populations, impede recreation and cause a drastic decrease in biodiversity (Colle and Shireman, 1980). Millions of dollars are spent each year for hydrilla maintenance each year in

Florida alone. Eradication is unlikely once a population has been well established, although eradication has been achieved in newly infested waters using a herbicide called



Sonar. Sonar is applied at a rate of 6 parts per billion and this concentration is maintained in the water for 180 days. Early detection can be crucial to an effective eradication program, and all lake residents and users are encouraged to be on the look-out for this invader.

In fall of 2006, this plant was found in Lake Manitou, in Rochester, Indiana. This is the first instance of hydrilla in the upper Midwest. Prior to its appearance in Lake Manitou, The closest infestations of hydrilla were in Tennessee and Pennsylvania.

Hydrilla can easily be confused with native elodea. The major difference is that elodea has sets of leaves on the stem in whorls of three, while hydrilla usually



has whorls of 5 leaves, although 4 to 9 leaves per whorl are possible with hydrilla. Hydrilla will also have small serrations on the leaf edges. More information on hydrilla can be found at the University of Florida's Center for Aquatic Invasive Plants (http://plants.ifas.ufl.edu/). More general information on aquatic invaders can be found at www.protectyourwaters.net.

12.0 Integrated Management Action Strategy

Eurasian watermilfoil was not found in Dewart Lake in 2007. Some areas of re-growth are expected in 2008 based on observations from other whole lake Sonar treatments. Any areas of Eurasian watermilfoil re-growth should be identified and treated with 2, 4-D herbicide in 2008. A vegetation control permit will be submitted without a treatment map for 2008, since it is unknown if or where any areas of EWM re-growth may occur. If Eurasian watermilfoil is found in Dewart Lake in 2008, spot treatments using 2, 4-D would be used to control the EWM.

Maintenance of the Eurasian watermilfoil population should be the highest priority. Spot herbicide treatments should be limited to areas of Eurasian watermilfoil infestation to protect the native species that are re-colonizing the lake. Treatment of native plants on the main lake is not likely to be permitted in 2008. This could give the native plants a competitive advantage over Eurasian watermilfoil.

Herbicide Treatment Specifications

If 2, 4-D is used for herbicide treatments, then a concentration at or near 1.76 parts per million should be used to ensure adequate control.

13.0 Project Budget

*All cost figures are estimates only. All prices are subject to change pending 2008 chemical pricing.

- 1. Chemically treat areas of Eurasian milfoil growth
 - A. Treat up to 25 acres for Eurasian milfoil with 2, 4-D \$9,500
- Conduct a spring visual survey and late season aquatic vegetation survey to monitor both Eurasian milfoil and native plant populations. Possibly conduct some mapping of some emergent vegetation.

Note: Emergent mapping protocol has not yet been established by the IDNR for this project. Survey and plan costs may increase depending on emergent requirements.

A. Aquatic Vegetation Surveys and Plan Update \$6,000

14.0 Monitoring and plan Update Procedures

In 2008 Aquatic Weed Control will conduct a spring visual vegetation survey to search for areas of Eurasian watermilfoil re-growth. Should any areas of re-growth be found, a treatment map will be submitted to the IDNR. Spot treatments for the control of Eurasian watermilfoil would follow the approval of the submitted treatment map. A late season Tier II aquatic vegetation survey will also be conducted to evaluate both native and



invasive plant populations. These surveys should help to detect any areas of Eurasian watermilfoil re-growth and will also document changes in the native plant community, as well as provide more data on the response of plant populations to whole lake Sonar treatments.

It is also possible that emergent plant beds in Dewart Lake may be mapped as well. No protocol has been received from the IDNR, so it is not yet known what the extent of this survey will be, or what the total costs for surveying and planning for emergents might be. Right now emergent mapping for Dewart Lake is not a requirement, but a possibility.

15.0 References

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16.0 Appendices

16.1 Herbicide Calculations

The following chart outlines rate calculations for DMA – 4 IVM Herbicide. It was taken directly from the DMA – 4 IVM specimen label on Dow AgroSciences website.

http://www.dowagro.com/ivm/invasive/prod/dma.htm

Submerged Aquatic Weeds: Including Eurasian Water Milfoil (Myriophyllum spicatum)

Treatment Site	Maximum Application Rate [†]	Specific Use Directions
Aquatic Weed Control in Ponds, Lakes, Reservoirs, Marshes, Bayous, Drainage Ditches, Canals, Rivers and Streams that are Quiescent or Slow Moving, Including Programs of the Tennessee Valley Authority	2.84 gallons (10.8 lb of acid equivalent) per acre foot	Application Timing: For best results, apply in spring or early summer when aquatic weeds appear. Check for weed growth in areas heavily infested the previous year. A second application may be needed when weeds show signs of recovery, but no later than mid-August in most areas. Subsurface Application: Apply DMA 4 IVM undiluted directly to the water through a boat mounted distribution system. Shoreline areas should be treated by subsurface injection application by boat to avoid aerial drift. Surface Application: Use power operated boat mounted boom sprayer. If rate is less than 5 gallons per acre, dilute to a minimum spray volume of 5 gallons per surface acre. Aerial Application: Use drift control spray equipment or thickening agents mixed with sprays to reduce drift. Apply through standard boom systems in a minimum spray volume of 5 gallons per surface acre. For Microfoil® drift control spray systems, apply DMA 4 IVM in a total spray volume of 12 to 15 gallons per acre. Apply to attain a concentration of 2 to 4 ppm (see table below).

[†]DMA 4 IVM contains 3.8 lb of acid equivalent per gallon of product.

Amount to Apply to Attain a Concentration of 2 to 4 ppm						
Surface Area	Average Depth (ft)	2,4-D Acid Equivalent to Apply (lb/acre)	Amount of DMA 4 IVM to Apply (gal/acre)			
	1	5.4 to 10.8	1.42 to 2.84			
1 acre	2	10.8 to 21.6	2.84 to 5.68			
	3	16.2 to 32.4	4.26 to 8.53			
	4	21.6 to 43.2	5.68 to 11.37			
	5	27.0 to 54.0	7.10 to 14.21			

The following table outlines rate calculations for Renovate 3 herbicide based on desired PPM and average depth of treatment area. It is taken directly from the Renovate 3 specimen label on SePRO Corporation's website: www.sepro.com

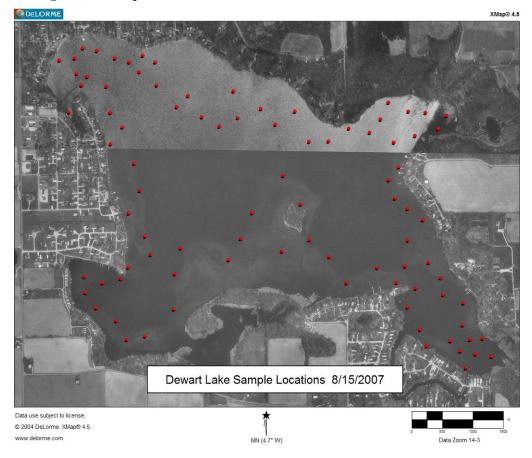


Concentration of Triclopyr Acid in Water (ppm ae)							
	Gallons of Renovate 3 per surface acre at specified depth						
Water Depth (feet)	0.75 ppm	1.0 ppm	1.5 ppm	2.0 ppm	2.5 ppm		
1	0.7	0.9	1.4	1.8	2.3		
2	1.4	1.8	3.3	3.6	4.6		
3	2.1	2.9	4.1	5.4	6.8		
4	2.7	3.6	5.4	7.2	9.1		
5	3.4	4.5	6.8	9.0	11.3		
6	4.1	5.4	8.1	10.9	13.6		
7	4.8	6.3	9.5	12.7	15.8		
8	5.5	7.2	10.9	14.5	18.1		
9	6.1	8.1	12.2	16.3	20.4		
10	6.8	9.0	13.6	18.1	22.6		
15	10.2	13.6	20.4	27.2	33.9		
20	13.6	18.1	27.2	36.2	45.3		



16.2 Species Distribution Maps

Figure 5: August 2007 Sample Locations





Dewart Lake Water Stargrass Locations 8/15/2007

Data use subject to license.

Figure 6: August 2007 Water Stargrass Locations



Dewart Lake American Pondweed Locations 8/15/2007

Data use subject to license.

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www.delorme.com

Data Zoom 14-3

Data Zoom 14-3

Figure 7: August 2007 American Pondweed Locations



Figure 8: August 2007 Brittle Naiad Locations





Figure 9: August 2007 Chara Locations

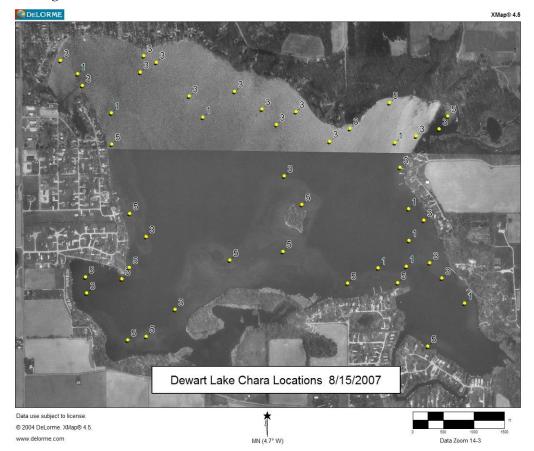
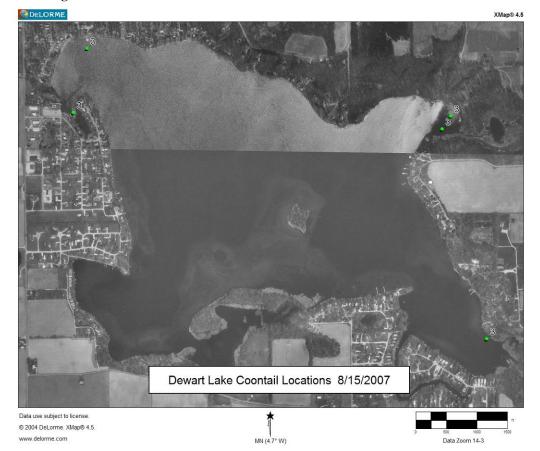




Figure 10: August 2007 Coontail Locations





Dewart Lake Curly-Leaf Pondweed Locations 8/15/2007

Data use subject to license.

Figure 11: August 2007 Curly Leaf Pondweed Locations



Dewart Lake Flat-Stemmed Pondweed Locations 8/15/2007

Data use subject to Icense.

Figure 12: August 2007 Flat-Stemmed Pondweed Locations



Dewart Lake Large-Leaf Pondweed Locations 8/15/2007

Dewart Lake Large-Leaf Pondweed Locations 8/15/2007

Distance subject to license.
© 2004 DeLarma: Mayor 4.5.

www. delorme.com

Figure 13: August 2007 Large Leaf Pondweed Locations



Figure 14: August 2007 Leafy Pondweed Locations





Figure 15: August 2007 Nitella Locations





Figure 16: August 2007 Sago Pondweed Locations

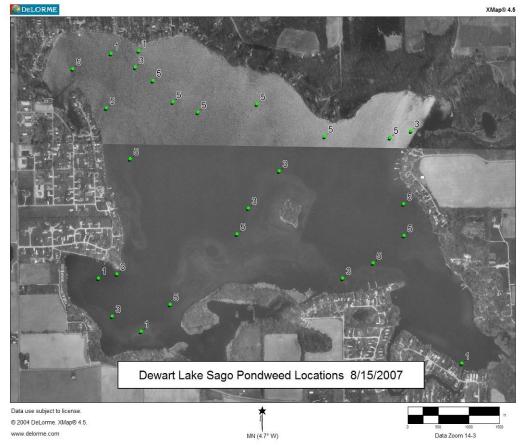




Figure 17: August 2007 Slender Naiad Locations





Data Zoom 14-3

Dewart Lake Small Pondweed Locations 8/15/2007

MN (4.7° W)

Figure 18: August 2007 Small Pondweed Locations

© 2004 DeLorme. XMap® 4.5.

www.delorme.com



16.3 Data Sheets

7140	atic Vegetation Random Sampling (Tier 2) <u>Waterbody Cover Sheet</u>
Surveying Organization:	Aquatic West Control
Contact Information:	574-533-2597
Waterbody Name:	ewart Lake ID: Dewart
County(s): Loscio	Sloo Date: August 15, 2007
Habitat Stratum:	Avg. Lake Depth (ft): Lake Level: Aug
Crew Leader: ave	Datum: Zone: Accura
Recorder: Dave K	e:ste WAAS Enabled GPS
Secchi Depth (ft):	Total # of Points Surveyed: Total # of Species:
Littoral Zone Size (acres) Measured	Littoral Zone Max. Depth (ft): Measured 134
Estimated	Estimate (historical Secchi Estimated (current Secchi max plant p
Notable Conditions:	Sago Pondwed very abundant. Errasian watermilfoil not found
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41.37245	-85.7818	6
41.3716	-85.7804	7
41.37038	-85.7801	8
41.36936	-85.7808	9
41.36833	-85.7798	10
41.36752	-85.7795	11
41.36695	-85.7808	12
41.36646	-85.7812	13
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41.36654	-85.7834	15
41.36583	-85.7833	16
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41.36509	-85.7781	21
41.36666	-85.778	22
41.36782	-85.7777	23
41.3673	-85.7748	24
41.36824	-85.7741	25
41.36939	-85.7734	26
41.36767	-85.7716	27
41.37105	-85.7716	28
41.36977	-85.7705	29
41.36819	-85.77	30
41.36744	-85.7688	31
41.36625	-85.7678	32
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41.36628	-85.7648	34
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41.36517	-85.7642	36
41.36418	-85.7634	37
41.36345	-85.763	38
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41.36309	-85.7601	42
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41.36379	-85.7597	44
41.36374	-85.7604	45
41.36437	-85.7609	46
41.36536	-85.7608	47
T1.00000	00.7000	71



41.36574	-85.7621	48
41.36649	-85.7622	49
41.36717	-85.7629	50
41.36701	-85.7643	51
41.36816	-85.7641	52
41.36908	-85.7633	53
41.36957	-85.7642	54
41.37003	-85.7649	55
41.37085	-85.7653	56
41.37143	-85.7647	57
41.37253	-85.765	58
41.37283	-85.7637	59
41.37313	-85.7624	60
41.37372	-85.7619	61
41.37386	-85.7631	62
41.37391	-85.7641	63
41.37431	-85.7653	64
41.37355	-85.7658	65
41.37298	-85.7664	66
41.37316	-85.7677	67
41.37258	-85.7689	68
41.37256	-85.77	69
41.37391	-85.7709	70
41.37334	-85.772	71
41.37403	-85.7729	72
41.37363	-85.7743	73
41.37482	-85.7745	74
41.37324	-85.7754	75
41.37367	-85.7764	76
41.3746	-85.7772	77
41.37412	-85.7779	78
41.37508	-85.7791	79
41.37612	-85.7792	80
41.37567	-85.7801	81
41.37611	-85.7807	82
41.37641	-85.7799	83
41.37628	-85.7816	84
41.37661	-85.7827	85
41.37673	-85.7835	86
41.37629	-85.784	87
41.3762	-85.7849	88
41.37561	-85.7839	89
41.37547	-85.7832	90
END		



16.4 LARE Resume

Aquatic Weed Control

P.O. Box 325

Syracuse, IN 46567 Phone: (574) 533-2597 Fax: (574) 534-8230

Email: jim@aquaticweedcontrol.com

Services:

- Herbicide Treatment
- Aquatic Plant Surveys
- Aquatic Vegetation Management Plans

Jim Donahoe: Owner/Operator

- Purdue University, West Lafayette, IN, Bachelor of Science: Agricultural Marketing
- 19 years as a state licensed chemical applicator and owner of Aquatic Weed Control

David Keister: Staff Biologist and licensed chemical applicator

- Bethel College, Mishawaka, IN, Bachelor of Science: Environmental Biology
- The Ohio State University, Columbus, OH, Ichthyology and Limnology classes at F.T. Stone Laboratory, Lake Erie.

Equipment: Aquatic Weed Control possesses all essential components needed to complete aquatic plant surveys, aquatic management plans and herbicide treatments.

- Survey and application boats
- WAAS enabled GPS
- Temperature and dissolved oxygen meters
- Lowrance Sonar
- Range Finders
- GPS Mapping Software
- Data Analysis Software
- Computers
- Laser Printers/scanners/copiers
- Aquatic vegetation sampling rake
- Plant Identification keys

Projects:

Aquatic Weed Control has been contracted to conduct vegetation surveys and write aquatic vegetation management plans for 9 separate Indiana Lakes. Each of these plans have been approved by the Lake and River Enhancement (LARE) biologists. Aquatic



Weed Control has conducted all chemical applications that have been funded by LARE on these lakes. The following list includes contact information for every LARE funded project conducted by Aquatic Weed Control.

Cree Lake

The Cree Lake Association 10686 North D Drive Kendallville, IN 46755

Services: Aquatic Vegetation Management Plan (no chemical treatment necessary)

Dewart Lake

The Dewart Lake Protective Association Inc.

P.O. Box 152

Syracuse, IN 46567

Services: Aquatic Vegetation Management Plan

Whole Lake Eurasian watermilfoil treatment for 2006 funded by LARE.

Contact: Mr. Mike Gill

58 EMS Lane D12 Syracuse, IN 46567 (574) 658- 4766

Lake Manitou

The Lake Manitou Association 1618 Bessmore Park Road Rochester, IN 46975

Services: Aquatic Vegetation Management Plan and update

Conducted spot treatments of Eurasian watermilfoil.

Contact: Orv Huffman

1618 Bessmore Park Road Rochester, IN 46975

Lake of the Woods

The Lake of the Woods Property Owners Association 3119 Sea Lane Bremen, IN 46506

Services: Aquatic Vegetation Management Plan and update Conducted a whole-lake treatment for Eurasian watermilfoil.

Contact: Mrs. Sharon Galminas

3119 Sea Lane Bremen, In 46506 (574) 546-4100



Lake Wawasee

The Wawasee Area Conservancy Foundation P.O. Box 548
Syracuse, IN 46567

Services: Aquatic Vegetation Management Plan

Contact: Heather Harwood P.O. Box 548 Syracuse, IN 46567 (574) 457-4549

Silver Lake

The Silver Lake Association 3332 West Neher Road Silver Lake, IN 46982

Services: Aquatic Vegetation Management Plan Conducted an early season curly leaf treatment of the entire littoral zone.

Skinner Lake

The Skinner Lake Association 2916 East Skinner Lake Road Albion, IN 46701

Services: Aquatic Vegetation Management Plan (no chemical treatment necessary)

Syracuse Lake

The Syracuse Lake Association P. O. Box 12 Syracuse, IN 46567

Services: Aquatic Vegetation Management Plan Conducted spot treatments for Eurasian watermilfoil

Waubee Lake

The Waubee Lake Association P.O. Box 275 Milford, IN 46542

Services: Aquatic Vegetation Management Plan Conducted spot treatments for Eurasian watermilfoil



16.5 IDNR Vegetation Control Permit

NSTRUCTIO	State Form 26727 (Approved State Boa Whole Lake	CONTROL PERMIT R4 / 2-04) ard of Accounts 2004 X Multiple Treatment Areas neck type of permit	FOR OFFICE USE ONLY License No. Date Issued Lake County	Return to: Page 1 of DEPARTMENT OF NATURAL RESOURCES Division of Fish and Wildlife Commercial License Clerk 402 West Washington Street, Room W273 Indianapolis, IN 46204 FEE: \$5.00
Applicant's N	ame		Lake Assoc. Name	ake Protective Association Inc.
Rural Route	or Street		Dewait L	Phone Number
City and Stat	•	P. O. Box 152		574-658-9762 ZIP Code
oity and Stat	е	Syracuse IN		46567
ertified App	licator (if applicable)		Company or Inc. Name	Certification Number
Rural Route	or Street			Phone Number
City and Stat	te	9		ZIP Code
Lake (One a	pplication per lake) Dewart	t Lake	Nearest Town Syracuse	County Kosciusko
Does water f	low into a water supply			Yes X No
	nt (ft) nethod: X Chemic eatment method, descri	ibe chemical used, method of ph	Biological Control sysical or mechanical control and	pending on survey Mechanical d disposal area, or the species and stocking
Plant survey		TO THE PERSON NAMED IN COLUMN TO THE	specify) Check if Target	
	Aquatic I	Plant Name	Species	Relative Abundance % of Community
	Areas done b	ased on surveys		
	Plant species pres	sent based on surveys		



	9		Page of
reatment Area #	LAT/LONG or UTM's		
otal acres to be	Proposed shoreline treatment leng	ath (ft)	Perpendicular distance from shoreline (ft)
ontrolled laximum Depth of			
Treatment (ft)	Expected date(s) of treatment(s)		e / Mid July / late August
	emical Physical	Biological Control	Mechanical
	escribe chemical used, method of phys eward, Aquakleen, Aquathak K		ol and disposal area, or the species and stocking
ant survey method: Rak			
	tic Plant Name	Check if Target Species	Relative Abundance % of Community
	The second secon		
	9	31	
		No.	
T.			
INSTRUCTIONS: Whoever to	treats the lake fills in "Applicant's Signature" (unless they are a profession	al. If they are a professional company
Applicant Signature	no specializes in lake treatment, they should s	sign on the "Certified Applica	Date
Certified Applicant's Signature			Date
	F	OR OFFICE ONLY	cololist
Appro	oved Disapproved	Fisheries Staff Spe	
Appro	oved Disapproved	Environmental Sta	uff Specialist
Mail check or money order in t	DEPARTMENT DIVISION OF FIS COMMERCIAL LI	HINGTON STREET ROO	



